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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: SEAN R. WAKAYAMA

Atty. Docket # R-8767

Serial Number: 08/917,480

Group Art Unit: 3641

Filed: August 26, 1997

Examiner: Dinh, T.

Title: RECONFIGURATION CONTROL SYSTEM  
FOR AN AIRCRAFT WING

NOTICE OF APPEAL

Hon. Assistant Commissioner of  
Patents and Trademarks  
Washington, D.C. 20231

Sir:

Applicant hereby appeals to the Board of Patent Appeals and Interferences from  
the Final Office Action, mailed February 1, 1999, finally rejecting Claims 1-20.

Please charge the statutory fee of \$310.00 and debit any underpayment and credit  
any overpayment to Deposit Account No. 16-2372. A duplicate original of this sheet is  
enclosed herewith.

Respectfully submitted,

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fee on  
paper  
#13

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FOR AN AIRCRAFT WING

**APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192**

Hon. Assistant Commissioner  
of Patents and Trademarks  
Washington, D.C. 20231

Sir:

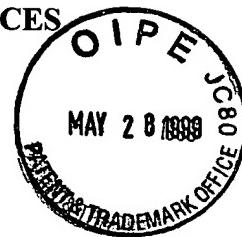
Appellant, within a three (3) month period from the mailing date of the Final Office Action (i.e., February 1, 1999), and concurrently with the filing of the "Notice of Appeal" (a "Petition for Extension of Time of One Month" is attached hereto), herewith files an "Appeal Brief" drafted in accordance with the provisions of 37 C.F.R. § 1.192(a), as follows:

**I. REAL PARTY IN INTEREST**

The above-captioned application is assigned, in its entirety, to McDonnell Douglas Corporation, a company organized under the laws of the State of Maryland.

**II. RELATED APPEALS AND INTERFERENCES**

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.



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Brief 3  
6/4/99  
J/S/mw

See on  
Appeal 13



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III. STATUS OF CLAIMS

Claims 1-20 stand finally- rejected under 35 U.S.C. § 102(b) as being anticipated by Ashkenas (USPN 2,549,045) - - hereinafter referred to simply as "Ashkenas"). This prior art rejection is herein being appealed.

IV. STATUS OF AMENDMENTS

Amendment "A" filed on November 23, 1998, which amended Claims 1, 11, and 19, has been entered, and an "Amendment After Final Which Supplements Response to Final Office Action" filed on March 26, 1999, which amended the specification to insert a statement of government rights, has also been entered.

V. SUMMARY OF THE INVENTION

The present invention is directed to a system to reconfigure each of the deflectable control surfaces located on the trailing edge of an aircraft wing (e.g., the wing of a blended wing-body aircraft) to a predetermined position that optimizes the spanwise force distribution across the wing for each of a plurality of different flight conditions. Unlike the previously available technology, the optimal position of each deflectable control surface is pre-calculated for each of a plurality of different flight conditions, and when a particular one of the plurality of flight conditions is encountered, each of the control surfaces is reconfigured to this pre-calculated (i.e., predetermined) optimal position for that particular flight condition.

Specific flight conditions include, but are not limited to, cruise, pitch maneuver, and low speed (e.g., takeoff and landing). The optimum spanwise force distribution across the wing is different for each of these different flight conditions, and thus, the optimal position of each

control surface is different for each of these different flight conditions.

With respect to the cruise flight condition, the control surfaces are preferably reconfigured to achieve a spanwise lift distribution that optimizes the lift-to-drag ratio while maintaining the aircraft at a trimmed angle-of-attack. Only minimal deflections of the control surfaces are necessary because the wing's baseline design is for optimal performance for the cruise condition.

In a pitch maneuver, the control surfaces are deflected to pitch the nose up or down, which increases loading on the wing frame. As such, the control surfaces are preferably reconfigured, in a pitch maneuver flight condition, to achieve a spanwise lift distribution across the wing that minimizes the increased bending moments (about the bending axis) that necessarily results from increased loading on the wing. Minimizing the bending moments is desirable because increased bending moments require stronger aircraft structures, which means larger and heavier aircraft structures. This desired minimization of bending moments is preferably achieved by deflecting the control surfaces to predetermined positions which increase inboard lift in conjunction with decreased lift near the wing tips, and further, to provide the aircraft with additional pitch trim necessary for the pitch maneuver.

For low speed flight conditions such as take-off and landing, it is desirable to maximize lift while maintaining trim. As such, for this flight condition, the control surfaces are preferably reconfigured to maximize lift and delay stall while simultaneously trimming the aircraft. In the preferred embodiment, this is achieved by deflecting control surfaces in stall-critical locations downwardly, to thereby increase lift at these locations, and by deflecting control surfaces in non-stall-critical locations upwardly, to thereby trim the aircraft.

## VI. ISSUE

Whether each of Claims 1-20 are unpatentable under 35 U.S.C. § 102(b) as being unpatentable over Ashkenas (USPN 2,549,045).

## VII. GROUPING OF CLAIMS

Claims 1, 9-11, and 19-20 constitute a first group of claims; Claims 2-4, and 12-14 constitute a second group of claims; Claims 5 and 15 constitute a third group of claims; Claims 6 and 16 constitute a fourth group of claims; and, Claims 7-8, and 17-18 constitute a fifth group of claims, for purposes of this appeal.

The first group of claims are directed to a an aircraft and method for reconfiguring each of a plurality of control surfaces located across the trailing edge of an aircraft wing (e.g., the wing of a blended wing-body aircraft) to a predetermined position that optimizes the spanwise force distribution across the wing for each of a plurality of different flight conditions.

The second group of claims are directed to an aircraft and method as in the first group of claims, but more specifically directed at minimizing the moment acting on the wing (as a result of the lifting force) for each of the plurality of flight conditions.

The third group of claims are directed to an aircraft and method as in the first group of claims, but more specifically directed at maximizing the lift-to-drag ratio of the wing during the cruise flight condition.

The fourth group of claims are directed to an aircraft and method as in the first group of



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claims, but more specifically directed at maximizing the spanwise lifting force without causing stall to occur at any of the chord lines when the wing is in the high lift at low speed flight condition.

The fifth group of claims are directed to an aircraft and method as in the first group of claims, but more specifically directed at optimizing the spanwise force distribution across the wing for the pitch maneuver flight condition.

### VIII. ARGUMENTS

#### VIII. A. THE FINAL REJECTION

In the Final Office Action (mailed February 1, 1999), the Examiner contends that "... the control surfaces of Ashkenas are reconfigurable to a plurality of predetermined positions to optimize the force distribution (or lift)", and further, that "[b]y setting the control surfaces of Ashkenas at various positions during flight, the controls do indeed 'optimize the spanwise force distribution across the wing' for the particular flight conditions that the aircraft is in."

In the Advisory Action mailed March 26, 1999, the Examiner maintains the Final Rejection, merely indicating that "prior art still reads upon what is claimed."

#### VIII. B. THE CITED PRIOR ART:

##### ASHKENAS (USPN 2,549,045)

This reference discloses a means and method for controlling tip stall in airplanes having swept-back wing panels. In particular, Ashkenas provides a means and method of automatically opening normally closed tip slots as a stall condition is approached, preferably at predetermined

values of lift coefficient of the wing tips. In lines 31-35 of Col. 2, Ashkenas states that "... trailing edge flap controls can be laid out to maintain their effectiveness at high angles of attack, and this effect can be efficiently utilized, such a flap layout, however, forming no part of the present invention."

### **VIII. C. CLAIMS 1, 9-11, and 19-20 ARE NOT ANTICIPATED BY ASHKENAS**

Claims 1, 9-11, and 19-20 (i.e., the first group of claims) each require reconfiguration of the control surfaces located along the trailing edge of the aircraft wing to a plurality of predetermined positions that optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions.

The only control surfaces located along the trailing edge of the aircraft disclosed in Ashkenas are the elevons 4, the split rudders 5, and the large area landing flaps 6. Ashkenas teaches absolutely nothing about how these control surfaces are controlled, much less a reconfiguration control system for controlling the position of each of these control surfaces in the specific manner as recited in Claims 1, 9-11, and 19-20. In this connection, the Examiner has not specified where in the Ashkenas patent any such teaching can be found, despite the fact that the Appellant specifically requested the Examiner to do so. In this regard, the Examiner has not even made out the requisite *prima facie* case of anticipation, and for this reason alone, the final rejection of the pending claims should be reversed. In particular, the Examiner has made a vague, indefinite, and totally unsupported general allegation that "... the control surfaces of Ashkenas are reconfigurable to a plurality of predetermined positions to optimize the force distribution (or lift)", and further, that "[b]y setting the control surfaces of Ashkenas at various positions during flight, the controls do indeed 'optimize the spanwise force distribution across the wing' for the particular flight conditions that the aircraft is in."

More specifically, Ashkenas does not even discuss controlling the positions of the control

surfaces at all, much less reconfiguring the control surfaces to predetermined positions for each of a plurality of different flight conditions, as Claims 1, 9-11, and 19-20 require. Further, Ashkenas does not even discuss optimizing the spanwise force distribution across the wing for any flight condition, much less for each of a plurality of flight conditions, much less how to reconfigure the control surfaces to predetermined positions that achieve optimized spanwise force distribution across the wing for each of the plurality of different flight conditions, as Claims 1, 9-11, and 19-20 require. In fact, all that the Examiner has even argued is that “[b]y setting the control surfaces of Ashkenas at various positions during flight, the controls do indeed ‘optimize the spanwise force distribution across the wing’ for the particular flight conditions that the aircraft is in.” However, in addition to not specifying where Ashkenas discloses what or who performs the “setting” of the control surfaces, the Examiner has essentially conceded a key point, i.e., that whatever or whoever performs the “setting” of the control surfaces does so “during flight”, so that rather than reconfiguring the control surfaces to a plurality of predetermined positions that optimize spanwise force distribution across the wing, the control surfaces are set in real-time (i.e., during flight), as opposed to being reconfigured to “pre-set” or “predetermined” positions, as Claims 1, 9-11, and 19-20 require.

Appellant has very carefully studied the Ashkenas patent and can find absolutely no teaching at all regarding how the deflectable control surfaces 4, 5, and 6 are operated and controlled, except the very brief passage below (col. 3, lines 15-21):

**Normal control of the airplane is by elevons 4 actuated either simultaneously or independently, and split rudders 5 for producing unilateral drag at the wing tips. Large area landing flaps 6 are positioned between the propeller housings 2 and the crew nacelle 7.**

Ashkenas does not even remotely suggest the desirability of predetermining the positions of the control surfaces that optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions, much less disclose how to do this, much less a

configuration control system for accomplishing this.

As Appellant has already pointed out in the previously-filed Amendment A, there is no question that the Appellant did not invent the general concept of control surfaces located along the trailing edge of an aircraft wing, nor the general concept of independently controlling the positions of these control surfaces as different flight conditions are encountered by the aircraft. Appellant is not attempting to claim this subject matter. Rather, what the Appellant has invented and is claiming is a method and system that selectively reconfigures these control surfaces to a plurality of *predetermined* positions that optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions.

In other words, the optimum positions of the control surfaces for each of the plurality of different flight conditions are *predetermined*, and thus, as a particular flight condition is encountered, these control surfaces can be reconfigured into their predetermined positions that result in *optimum spanwise force distribution across the wing for that particular flight condition*. Ashkenas does not even remotely suggest the desirability of doing this, much less provide an enabling disclosure of how to do this. Quite simply put, Ashkenas is not even remotely relevant to a consideration of the patentability of the pending/finally-rejected claims of the present application.

For the above and foregoing reasons, and, in addition, for the reasons already of record in this application (which are hereby fully incorporated herein by reference), Appellant respectfully requests the Board to reverse the final rejection of Claims 1, 9-11, and 19-20 under 35 U.S.C. § 102(b).

#### **VIII. D. CLAIMS 2-4, and 12-14 ARE NOT ANTICIPATED BY ASHKENAS**

For the reasons fully set forth above, independent Claims 1 and 11 from which Claims 2-4 and 12-14 (the *second group* of claims) depend, respectively, are not anticipated by Ashkenas.

Thus, since the independent claims from which Claims 2-4 and 12-14, respectively, depend are patentable over the art of record, then Claims 2-4 and 12-14 must likewise be patentable.

Moreover, the Examiner has not even addressed any of the additional limitations recited in these dependent claims of the present application. For example, Claim 2 recites that "the control surface reconfiguration system also minimizes the moment [acting on the wing] for at least one of the different flight conditions." In addition to the fact that Ashkenas does not even disclose a "control surface reconfiguration system" at all, Ashkenas certainly does not even remotely suggest that such a system should also minimize the moment acting on the wing. Claim 3 recites the further limitation that "the control surface reconfiguration system minimize the moment for structurally crucial flight conditions", and Claim 4 recites the further limitation that "the control surface reconfiguration system also trims the wing." Clearly neither of these additional limitations recited in Claims 3 and 4 can be found anywhere in Ashkenas. In this connection, the Examiner has a duty to specify where the prior art reference relied upon teaches what the Examiner claims that it teaches. The Examiner has utterly failed to specify where Ashkenas teaches any of the above-delineated claim limitations set forth in Claims 2-4, and parallel limitations set forth in Claims 12-14.

For the above and foregoing reasons, and, in addition, for the reasons already of record in this application (which are hereby fully incorporated herein by reference), Appellant respectfully requests the Board to reverse the final rejection of Claims 2-4 and 12-14 under 35 U.S.C. § 102(b).

### **VIII. E. CLAIMS**

For the reasons fully set forth above, independent Claims 1 and 11 from which Claims 5 and 15 (the third group of claims) depend, respectively, are not anticipated by Ashkenas. Thus, since the independent claims from which Claims 5 and 15, respectively, depend are patentable over the art of record, then Claims 5 and 15 must likewise be patentable.

Moreover, the Examiner has not even addressed any of the additional limitations recited in these dependent claims of the present application. For example, Claim 5 recites the additional limitation that “the control surface reconfiguration system functions to maximize the lift-to-drag ratio of the wing during the cruise flight condition”. Claim 15 recites an analogous limitation. Clearly this additional limitation recited in Claims 5 and 15 can not be found anywhere in Ashkenas. In this connection, the Examiner has a duty to specify where the prior art reference relied upon teaches what the Examiner claims that it teaches. The Examiner has utterly failed to specify where Ashkenas teaches the above-delineated claim limitation set forth in Claims 5 and 15.

For the above and foregoing reasons, and, in addition, for the reasons already of record in this application (which are hereby fully incorporated herein by reference), Appellant respectfully requests the Board to reverse the final rejection of Claims 5 and 15 under 35 U.S.C. § 102(b).

#### **VIII. F. CLAIMS**

For the reasons fully set forth above, independent Claims 1 and 11 from which Claims 6 and 16 (the fourth group of claims) depend, respectively, are not anticipated by Ashkenas. Thus, since the independent claims from which Claims 6 and 16, respectively, depend are patentable over the art of record, then Claims 6 and 16 must likewise be patentable.

Moreover, the Examiner has not even addressed any of the additional limitations recited in these dependent claims of the present application. For example, Claim 6 recites the additional limitation that “the control surface reconfiguration system functions to maximize the spanwise lifting force without causing stall to occur at any of the chord lines when the wing is in the high lift at low speed flight condition. Claim 16 recites an analogous limitation. Clearly this additional limitation recited in Claims 6 and 16 can not be found anywhere in Ashkenas. In this

connection, the Examiner has a duty to specify where the prior art reference relied upon teaches what the Examiner claims that it teaches. The Examiner has utterly failed to specify where Ashkenas teaches the above-delineated claim limitation set forth in Claims 6 and 16.

For the above and foregoing reasons, and, in addition, for the reasons already of record in this application (which are hereby fully incorporated herein by reference), Appellant respectfully requests the Board to reverse the final rejection of Claims 6 and 16 under 35 U.S.C. § 102(b).

### **VIII. G. CLAIMS**

For the reasons fully set forth above, independent Claims 1 and 11 from which Claims 7-8-4 and 17-18 (the fifth group of claims) depend, respectively, are not anticipated by Ashkenas. Thus, since the independent claims from which Claims 7-8 and 17-18, respectively, depend are patentable over the art of record, then Claims 7-8 and 17-18 must likewise be patentable.

Moreover, the Examiner has not even addressed any of the additional limitations recited in these dependent claims of the present application. For example, Claim 7 recites the additional limitation that “the control surface reconfiguration system functions to achieve the required lifting force during the pitch maneuver flight condition”; and, Claim 8 recites the additional limitation that “the control surface reconfiguration system functions to shift the spanwise force distribution towards the longitudinal axis without reducing lifting force, during the pitch maneuver flight condition”. Claims 17-18 recite analogous limitations. In this connection, the Examiner has a duty to specify where the prior art reference relied upon teaches what the Examiner claims that it teaches. The Examiner has utterly failed to specify where Ashkenas teaches the above-delineated claim limitation set forth in Claims 7-8 and 17-18.

For the above and foregoing reasons, and, in addition, for the reasons already of record in this application (which are hereby fully incorporated herein by reference), Appellant respectfully

requests the Board to reverse the final rejection of Claims 7-8 and 17-18 under 35 U.S.C. § 102(b).

**SUMMARY**

In summary, Appellant respectfully requests the Board to reverse the final rejection of all of the appealed claims, and to find each of the claims to be allowable for defining subject matter which is patentable over Ashkenas.

This Appeal Brief is submitted in triplicate, and authorization for payment of any underpayment of the required Brief fee or extension fees, or any other fees that may be required to maintain pendency of this application, by charging Deposit Account Number 16-2372, is hereby given.

Appellant will delay a final decision with respect to any request for an oral argument until after review of the Examiner's Answer.

Respectfully submitted,

  
Robert A. Westerlund  
Reg. No. 31,439  
(703) 706-5862/3

Attachments: Appendix Containing Finally Rejected Claims Under Appeal Herein

NOTE: For the convenience of the Board, Appellant's Section IX, containing the claims on appeal is contained on a separate APPENDIX sheet following the below signatory portion of this Appeal Brief, to thereby enable the Board to detach this APPENDIX without disturbing the integrity of the remainder of this Appeal Brief.

Date: May 28, 1999

Attorney Docket No.: R-8767

## IX. APPENDIX

### FINALLY REJECTED CLAIMS UNDER APPEAL HEREIN:

1. An aircraft, including:

a wing having a trailing edge and deflectable control surfaces located along the trailing edge, the wing being capable during flight of generating a normal lifting force having a spanwise force distribution across the wing; and

a control surface reconfiguration system wherein the control surfaces are selectively reconfigurable to a plurality of predetermined positions as required to optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions.

2. The aircraft as set forth in Claim 1, wherein:

the lifting force generates a moment acting on the wing; and

the control surface reconfiguration system also minimizes the moment for at least one of the different flight conditions.

3. The aircraft as set forth in Claim 2, wherein:

the control surface reconfiguration system minimizes the moment for structurally crucial flight conditions.

4. The aircraft as set forth in Claim 1, wherein the control surface reconfiguration system also trims the wing.

5. The aircraft as set forth in Claim 1, wherein:

one of the different flight conditions comprises cruise, with the wing having a lift-to-drag ratio during cruise; and

the control surface reconfiguration system functions to maximize the lift-to-drag ratio of

the wing during the cruise flight condition.

6. The aircraft as set forth in Claim 1, wherein:

the wing includes a plurality of chord lines;

one of the different flight conditions comprises high lift at low speed; and,

the control surface reconfiguration system functions to maximize the spanwise lifting force without causing stall to occur at any of the chord lines when the wing is in the high lift at low speed flight condition.

7. The aircraft as set forth in Claim 1, wherein:

one of the different flight conditions comprises a pitch maneuver; and,

the control surface reconfiguration system functions to achieve the required lifting force during the pitch maneuver flight condition.

8. The aircraft as set forth in Claim 7, wherein:

the aircraft has a longitudinal axis of symmetry; and,

the control surface reconfiguration system functions to shift the spanwise force distribution towards the longitudinal axis without reducing the lifting force, during the pitch maneuver flight condition.

9. The aircraft as set forth in Claim 1, wherein the aircraft is a blended wing-body aircraft.

10. The aircraft as set forth in Claim 1, wherein the different flight conditions include cruise, takeoff, and pitch maneuvers.

11. An aircraft, including:

a wing having a trailing edge and deflectable control surfaces located along the trailing edge, the wing being capable during flight of generating a normal lifting force having a

spanwise force distribution across the wing; and

reconfiguration means for selectively reconfiguring the control surfaces to a plurality of predetermined positions as required to optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions.

12. The aircraft as set forth in Claim 11, wherein:

the lifting force generates a moment acting on the wing; and

the reconfiguration means functions to minimize the moment for at least one of the different flight conditions.

13. The aircraft as set forth in Claim 11, wherein:

the control surface reconfiguration system minimizes the moment for structurally crucial flight conditions.

14. The aircraft as set forth in Claim 11, wherein the reconfiguration means also trims the wing.

15. The aircraft as set forth in Claim 11, wherein:

one of the different flight conditions comprises cruise, with the wing having a lift-to-drag ratio during cruise; and

the reconfiguration means functions to maximize the lift-to-drag ratio of the wing during the cruise flight condition.

16. The aircraft as set forth in Claim 11, wherein:

the wing includes a plurality of chord lines;

one of the different flight conditions comprises high lift at low speed; and,

the reconfiguration means functions to maximize the spanwise lifting force without causing stall to occur at any of the chord lines when the wing is in the high lift at low speed flight condition.

17. The aircraft as set forth in Claim 11, wherein:

one of the different flight conditions comprises a pitch maneuver; and,

the reconfiguration means functions to achieve the required lifting force during the pitch maneuver flight condition.

18. The aircraft as set forth in Claim 17, wherein:

the aircraft is a blended wing-body with a longitudinal axis of symmetry; and,

during the pitch maneuver, the reconfiguration means functions to shift the spanwise force distribution towards the longitudinal axis without reducing the lifting force.

19. A method for controlling flight of a blended-wing aircraft which includes a wing having a trailing edge and control surfaces located along the trailing edge which are deflectable in upward and downward directions, the wing being capable during flight of generating a normal lifting force having a spanwise distribution across the wing, the method including the steps of:

reconfiguring the control surfaces upwardly or downwardly to a plurality of predetermined positions as required to optimize the spanwise force distribution across the wing for each of a plurality of different flight conditions, and to simultaneously control trim.

20. The method as set forth in Claim 19, including the step of reconfiguring the control surfaces to control trim of the aircraft.